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AUTHOR Hill, Kennedy T.; Horton, Margaret W.
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ABSTRACT

Educational solutions to the problem of test anxiety were explored. Test anxiety has a debilitating effect on performance which increases over the school years. The solution is, first, to measure test anxiety so that the extent of it, as well as the effectiveness of programs designed to alleviate it, can be measured. The seven-item Comfort Index, a shortened version of Sarason's Test Anxiety Scale for Children, was employed in five studies conducted to determine optimal testing conditions. Each study generally allowed more time than the standard testing condition, or more information about the difficulty level and expected performance, or both. Under optimal conditions, anxious students had similar performance as low-anxious students. A curriculum of test taking skills was developed for a number of subject areas and presented in grades 2, 3-4, and 5-6. Results showed significant gains in achievement test performance at all levels. Significant gains were noted for one-quarter to one-third of the participants, with high test-anxious students showing the most gains. The curriculum was evaluated by inservice and preservice teachers. Those who expressed an interest in test taking skills rated it as more effective and important than those with little interest or than inexperienced student teachers. (GDC)

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# Teaching and Testing Solutions to the Problem of Debilitating Effects of Test Anxiety on Test Performance

Kennedy T. Hill, Ph.D.
University of Illinois

Margaret W. Horton, Ed.D.
Stetson University

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Teaching and Testing Solutions to the Problem of Debilitating Effects of Test Anxiety on Test Performance

Authors

Kennedy T. Hill
Professor of Educational Psychology and Psychology
Institute for Child Behavior and Development
University of Illinois, Urbana-Champaign

Address: 149 Children's Research Center
University of Illinois
51 Gerty Drive
Champaign, IL 61820

Biographical Notes: B.A. Yale University, 1962, Ph.D. University of Minnesota, 1965. Has been on the faculty of the University of Illinois for 20 years and is currently Professor and Director of the Interdisciplinary Program in Human Development. Long-term program of research has focused on basic and applied research on test anxiety and evaluation, with additional interests in educational policy and change. Has written numerous articles and chapters in these areas. Is a fellow of divisions 7,8, and 15 of APA.

Margaret W. Horton
Professor of Education
College of Education
Stetson University, DeLand

Address: Box 8380
Stetson University
DeLand, Florida 32720

Biographical Notes: Ed.D. West Virginia University, 1967. Professor and Director of Student Teaching and Clinical Experiences at Stetson University. Has major interest in developing competency-based student teacher training, first implemented under her direction at Stetson in 1969. Research and development activities have focused on teacher evaluation and improvement of instruction. Co-author with Donald Gill and Robert Soar of forthcoming book, Excellence in Teaching: A Practical Guide for Educators.

TEACHING AND TESTING SOLUTIONS TO THE PROBLEM OF DEBILITATING EFFECTS OF TEST ANXIETY ON TEST PERFORMANCE

It has been known for some time that test anxiety in children lowers their performance on achievement tests and in school (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960). Only recently, however, has the full scope and intensity of the debilitating effects of test anxiety been established (Ames & Ames, 1984; Fyans, 1980; Hill, 1984; I. G. Sarason, 1980). This paper reviews teaching and testing programs that have been developed to help students cope with the demands and pressures of testing and to show optimal performance in any test situation.

## The Nature and Importance of Test Anxiety Effects

Debilitating test anxiety refers to the fact that many high anxious students fail to show what they have learned on achievement and other tests due to inappropriate test-taking behaviors and strategies which interfere with performance (Hill & Wigfield, 1984). As a result, the test scores of anxious children provide a low, invalid estimate of what they have learned and achieved.

The intefering effects of test anxiety are seen in the negative correlation between test anxiety and test performance, which begins at about the second or third grade (Hill & S. B. Sarason, 1966). This correlation increases steadily across the public school years, from about -.20 in second/third grade to -.40 about sixth grade to -.60 in eleventh grade (Hill, 1984). These correlations reflect strong effects for individual children. By the sixth grade, for example, the 10 percent least anxious students are a year ahead of average while the 10 percent most anxious students are more than a year behind average, the two groups being over two years apart in tested achievement (Hill & Sarason, 1966). Recent data suggests that between

a third to one half of all students suffer interfering effects of test anxiety (Hill, 1984).

Debilitating effects of test anxiety are quite broad and general. They strongly effect both boys and girls, lower and middle class students, and Black, white and Hispanic students (Willig, Harnisch, Hill, & Maehr, 1983). Test anxiety relates strongly (and negatively) not only to educational test performance but also to measures of classroom learning (such as report card grades), school progress (for example, being held back a grade), and a wide variety of learning and cognitive tasks (Hill, 1980).

In summary, the debilitating effects of test anxiety on students' classroom and test performance are strong, increase across the school years, and have been found for students of all sociocultural backgrounds and ability levels.

Educational Solutions to the Problem of Test Anxiety

1. Measurement of text anxiety. One of the first priorities in developing educational teaching and testing programs that reduce or eliminate the problem of test anxiety is to have a valid, easy to adminster, cost-efficient measure of test anxiety. Such a measure allows schools to assess the nature and strength of test anxiety effects for their students and to evaluate the effectiveness of programs designed to alleviate the problem.

Test anxiety was originally measured by the Test Anxiety Scale for Children (Sarason et al., 1960). This 30-item questionnaire asks students if they worry when tested or evaluated in a variety of other situations in school. Recently a short, positive version of this anxiety scale called the Comfort Index has been developed and validated (Harnisch, Hill & Fyans, 1980). The 7-item Comfort Index asks students if they feel relaxed in test situations. It has been found in statewide testing to have good reliability and validity, comparable to that of the Test Anxiety Scale for Children (see

Hill, 1984). The Comfort Index has been used successfully with students in grades 2 through 11, including much of the intervention research reviewed here. The positive nature of its questions, short administration time, and reliability and validity of the Comfort Index have made it the preferred measure of test motivation among school staff taking part in collaborative school-university research projects.

2. Optimal testing conditions. The next step in our program of research was the development of optimal testing conditions designed to reduce the interfering effects of test anxiety on test performance. The purpose of this research was to see if high test anxious students performed better under optimal than standard testing conditions. This would be important for several reasons. First, it would establish causality in the test anxiety/test performance negative correlations. If high anxious students know the material being tested but do poorly on tests due to inappropriate test-taking behavior, then they should do better under optimal testing conditions designed to reduce anxiety and eliminate such behavior. If, on the other hand, high anxious students do poorly on tests because they don't know the material (which makes them become anxious in test situations), then performance will not change under optimal testing conditions. Gains of high test anxious students under optimal testing conditions would also help clarify why these children do poorly under standard testing conditions and suggest better ways to give tests to find out what these students have learned.

A series of optimal testing condition studies have been carried out beginning with controlled laboratory experiments and culminating with school intervention testing programs (see Hill, 1980, 1984, for details). Students in these studies have ranged from second through eighth graders. The initial laboratory research involved testing students individually on mathematics

computation problems in a voluntary research project. The final research involved giving the achievement test used by the collaborating school district under special group testing conditions as part of that year's school testing, with test scores used for all usual purposes (including class placement). In each of the five optimal testing condition studies, the major change from standard to optimal testing conditions was to give students either more time to complete the test or more information about the difficulty level and expected performance level, or both. These testing parameters were chosen because of earlier research suggesting the importance of time pressure and failure dynamics in determining many of the debilitating effects of test anxiety.

Results were similar in all five studies. Under standard testing conditions, low anxious students performed much better than high anxious students, often obtaining twice as many correct answers and going much faster through the test. Under optimal testing conditions, however, high test anxious students usually caught up, matching both the performance level and response rate of their less anxious counterparts. The results suggest that the low performance of high test anxious students is not due to poor learning or cognitive deficits, but rather due to test-taking skill deficits and motivational problems (see Hill, 1984).

The optimal test condition research suggests that one solution to the problem of test anxiety is to develop alternative ways to give classroom and standardized tests--for example, under the optimal testing conditions just discussed. One possibility is to use a dual testing program in which students are first tested under standard testing conditions and then again under optimal testing conditions (with some children tested under standard conditions twice to provide a control for test-retest effects). It would be expected that students with motivational and test-taking problems would show

the greatest increases in performance between the standardized and optimal testing conditions. Such results would confirm the presence of debilitating anxiety effects as well as provide a more valid estimate of high anxious students' learning and achievement. Such results would also identify students having significant test-taking problems (those who gain the most under optimal testing conditions), students who should benefit greatly from the teaching programs to be discussed next.

3. Teaching test-taking skills. In the long run, the best solution to the problem of test anxiety is to help students develop the motivational dispositions and test-taking skills needed to cope with the demands and pressures of testing. Toward this end, a classroom curriculum teaching test-taking skills has been developed involving nine half-hour sessions. The program begins with a general discussion of the nature and purpose of testing and a review of major test-taking skills. Each of the subsequent eight sessions focuses on a content area within reading, language arts, or mathematics assessed on most standardized tests--for example, reading paragraphs, capitalization and punctuation, and mathematics computation.

The classroom curriculum provides students with information, test-taking strategies, and tips on how to cope with the major demands and stresses of testing. These demands include time pressure, difficult material, long testing sessions, complicated instructions, unfamiliar question and answer formats, and computerized answer sheets. In each of the eight sessions dealing with a subject area (for example, language mechanics), the teacher describes general test-taking strategies and skills as well as those specific to the content area. Students also receive guided practice on problems developed for the program in formats typical of educational tests.

Different versions of the curriculum have been developed for grades 2, 3-4, and 5-6 as a function of the motivational and test-taking skill needs

and developmental maturity of students at each of these levels. The curriculum has been used now by 40 professional and student teachers in Illinois and Florida with over one thousand students. The validation studies are described here and in-service and pre-service projects next.

The classroom curriculum has been validated in several studies involving random assignment of teachers to teaching and control groups (see Hill, 1984). Test anxiety, as measured by the Comfort Index discussed earlier, was entered as a factor in the design. The effect of the program was assessed by performance on the full-scale achievement test given by the collaborating school district under standard testing conditions. Each student's performance on the previous year's achievement test was partialed out in the analysis of covariance used to statistically test effects of the curriculum. This both controlled for individual differences in test performance and measured actual gains in test performance from the curriculum.

The classroom curriculum resulted in significant gains in test performance at all three age levels studied. Compared to the control group, students in the teaching group increased in achievement test performance by 10 percentile points in grade 2, nine percentile points in grades 3-4, and six percentile points in grades 5-6. In the teaching groups, high test anxious students showed twice the gains of low test anxious students in grades 3-4, with both groups showing moderate gains in grades 5-6. Table 1 shows the percentage of students in the teaching and control groups showing either large gains (10 percentile points or more) or large losses (10 percentile points or more) from previous testing. As can be seen, some three times as many students in the teaching groups (23% across grade levels) show

Table 1

Percent of students in grades 2-6 in teaching and control groups showing much higher or lower achievement test performance than expected from their previous test performance

| Achievement Test Performance Level | Grade Level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Grade 2 | | Grades 3-4 | | Grades 5-6 | | Grades 2-6 | |
| | Teaching (N=30) | Control (N=22) | Teaching (N=54) | Control (N=26) | Teaching (N=48) | Control (N=42) | Teaching (N=132) | Control (N=90) |
| Total Achievement Test Score 10 percentile or more higher than expected | 17% | 5% | 20% | 8% | 31% | 7% | 23% | 7% |
| Total Achievement Test Score 10 percentile or more lower than expected | 10% | 27% | 15% | 35% | 10% | 17% | 12% | 24% |

large gains compared to the control groups, for which only one child in 14 (7%) showed such gains. Conversely, only half as many students in the teaching groups (12%) showed large losses compared to the control groups (24%). In summary, the classroom curriculum leads to significant gains in test performance for between one-quarter to one-third of the students receiving it, with high test anxious students tending to show the largest gains.

4. In-service and pre-service teacher education. The classroom curriculum teaching test-taking skills has been further field tested by in-service and pre-service projects in Illinois and Florida, again involving students in grades two through six (see Hill & Horton, 1985). The program has been evaluated in these projects by a teacher questionnaire which includes ratings on a seven point scale of the effectiveness of the curriculum and the importance of using the curriculum in future years. Results for the 40 teachers making these ratings from five samples are presented in Table 2. As can be seen, teachers in the original validating sample rated the program very effective (Mean = 6.2) and very important to use in future years (Mean = 6.1). Eighty-seven percent of these teachers gave a high rating (6 or 7 on the 7-point scale) for both effectiveness and importance of use. These teacher ratings of program effectiveness, of course, parallel the gains from the program discussed just above.

Teachers in the in-service projects were divided into those who volunteered to give the curriculum and those who were assigned the curriculum. As can be seen in Table 2, these two groups differed markedly in their evaluation of the program. Teachers who volunteered to give the

Table 2

Teacher ratings of effectiveness and importance of using classroom curriculum teaching students in grades 2-6 test-taking skills

| Samples of Teachers | Ratings | | | |
|---|---|---|---|---|
| | Effectiveness | | Importance of Using | |
| | Mean Rating | % of High Ratings* | Mean Rating | % of High Ratings* |
| Validating Sample (N=8) | 6.2 | 87% | 6.1 | 87% |
| In-Service Samples | | | | |
| Voluntary (N=13) | 6.2 | 92% | 6.3 | 100% |
| Assigned (N=5) | 4.4 | 0% | 4.6 | 0% |
| Pre-Service Samples | | | | |
| Initial Group (N=5) | 4.0 | 0% | 5.0 | 40% |
| Second Group (N=9) | 4.8 | 33% | 4.1 | 22% |

*Rating of 6 or 7 on 7-point scale, from 7 (very effective, very important) to 1 (not very effective, not very important)

program rate it as being just as effective and important to use as the validating teachers. In fact, every one of the volunteer teachers give a high rating of the importance of using the teaching program. In contrast, the teachers assigned the program rate it much lower in effectiveness and importance of use, and none of these teachers rate it as being important to use in future years.

Ratings of the curriculum by student teachers using the program as part of preservice teacher training at Stetson University are presented at the bottom of Table 2. These student teachers rate the program as moderately effective and important to use with relatively few high ratings. The student teachers had had little experience with elementary school children in testing situations, and many of them reported it was difficult to master the curriculum upon first presentation.

The teacher ratings taken as a whole suggest that professional teachers who express an interest in or who are receptive to using the classroom curriculum teaching test-taking skills almost uniformly rate it as highly effective and very important to use. In contrast, professional teachers who do not have as great an interest in the curriculum and student teachers who have not had experience with children in the testing situation do not rate the program as highly effective or important to use (although half rate it as above average on the 7-point scale). If the curriculum is to be implemented effectively, it clearly must have the interest and support of participating teachers, which, of course, is true of educational programs in general.

## Concluding Comments

The teaching and testing programs reviewed here were developed in response to increasing evidence of the strong and widespread debilitating effects on test anxiety on test performance throughout the public school years. These interfering effects can be quite harmful to high test anxious

students since their low, invalid test scores contribute to evaluation of their learning and achievement, report card grades, placement in mathematics and other classes, and promotion and high school graduation. Test anxiety's debilitating effect on the test performance of one-third to one-half of students also impacts negatively on our ability to assess the effectiveness of educational programs. The ability of students to demonstrate their knowledge under the demands and pressures of standardized testing, of course, is a separate matter addressed by the testing and teaching programs reviewed here.

The seven-item Comfort Index is recommended for use by school disticts developing programs to deal with the problem of test anxiety. The correlation of the Comfort Index with test performance provides a good estimate of the nature and strength of test anxiety effects in the district and alerts teachers, parents, and governing boards to the need to address the problem. The very assessment of test anxiety through use of the Comfort Index will increase the concern and priority given to the problem of test anxiety.

The optimal testing conditions discussed earlier can be used for any kind of educational testing, including achievement testing, classroom testing, and minimal competency testing. Optimal testing conditions are particularly important for competency testing where the consequences of failing (not being promoted, not graduating) are strong and public. Pressure and anxiety should be particularly high for such testing situations (see Hill, 1984). The dual testing program involving both standard and optimal testing conditions might be tried initially with targeted groups, for example, students scoring low on the Comfort Index, underachieving students, etc. Optimal testing conditions also might initially be used with portions of achievement tests, for example, reading and mathematics computation subtests. These would be simple and

cost-efficient ways to initially test the usefulness of a dual testing program.

The classroom curriculum teaching test-taking skills shows promise as an immediate as well as long range solution to the problem of debilitating test anxiety. About a quarter of the students receiving the program in validation studies showed large gains in test performance (10 percentile points or more). Even larger effects would be expected for students receiving the program over several years, perhaps eventually with short booster programs. Individual tutoring programs under development may produce still larger gains. Other programs under development include a classroom curriculum for middle school/junior high school age students, special programs for gifted students, and a short form of the classroom curriculum which can be incorporated into testing procedures.

Testing is playing an increasing role in American education both in evaluation and placement of individual students and in evaluating our educational system itself. This increased reliance on testing should further enhance the demands and pressures of testing and further exacerbate the debilitating effects of test anxiety. If educational testing and teaching programs are not modified to help students deal with the increased pressures of testing, test scores and learning itself may actually decrease, much to the detriment not only of individual students but also to our educational system.

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